

1 **Amendment to the Claims**

2 **In the Claims:**

3 Please add new Claims 47-52, as indicated below.

4 Also, please amend Claims 1-5, 7, 8, 10, 11, 22-25, 33-35, and 42 as follows:

5 1. (Currently Amended) A bending die for use in sheet metal forming, comprising:

6 (a) a first working surface extending longitudinally relative to a longitudinal axis
7 of the bending die, the first working surface being generally planar and comprising a first inner edge
8 extending longitudinally relative to the longitudinal axis of the bending die;

9 (b) a second working surface extending longitudinally relative to the longitudinal axis
10 of the bending die and disposed adjacent to said first working surface, the second working
11 surface being generally planar and comprising a second inner edge extending longitudinally relative
12 to the longitudinal axis of the bending die, the first inner edge and the second inner edge being
13 oriented substantially adjacent to one another in a facing relationship; and

14 (c) a frame configured to provide support for said first and second working
15 surfaces, while enabling said first and second working surfaces to move relative to the frame, such
16 that a substantially fixed separation between adjacent edges of the first and second working surfaces
17 the first inner edge and the second inner edge is maintained, regardless of a rotational angular
18 displacement of either of the first and second working surfaces.

19 2. (Currently Amended) The bending die of Claim 1, wherein said adjacent edges of said first
20 and second working surfaces first inner edge and second inner edge are separated by a
21 substantial gap having a predefined width, said substantial gap affecting a configuration of the sheet
22 metal formed with the bending die.

23 3. (Currently Amended) The bending die of Claim 1, wherein the adjacent edges of said first
24 and second working surfaces first inner edge and second inner edge substantially abut one another.

25 4. (Currently Amended) The bending die of Claim 1, wherein said frame comprises a first
26 section and a second section, a position of said first section relative to said second section being
27 adjustable to enable a width of a gap separating the adjacent edges of said first and second working
28 surfaces first inner edge and second inner edge to be adjusted to a desired dimension.

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1 5. (Currently Amended) The bending die of Claim 1, wherein for each working surface:

2 (a) a center of rotation is associated with the working surface;

3 (b) relative to a portion of the working surface that is in contact with the metal
4 sheet during metal forming, the center of rotation is disposed proximate to an inner edge of said
5 portion; and

6 (c) regardless of the rotational angular displacement of the working surface, the
7 center of rotation remains substantially fixed relative to each working surface.

8 6. (Original) The bending die of Claim 1, further comprising a hinge assembly disposed at
9 each end of the first and second working surfaces, each hinge assembly pivotally coupling said first
10 and second working surfaces together, such that a rotational displacement of one of said first and
11 second working surfaces results in a corresponding rotational displacement of the other one of said
12 first and second working surfaces, through an opposite rotational direction.

13 7. (Currently Amended) The bending die of Claim 6 Claim 47, wherein at least one hinge
14 assembly includes a return spring that applies a restoring force to return said first and second working
15 surfaces to their respective original positions after the sheet metal has been deformed in the bending
16 die, and after a force is no longer applied to deform the sheet metal and the sheet metal has been
17 removed from the bending die.

18 8. (Currently Amended) The bending die of Claim 6 Claim 47, wherein each hinge assembly
19 comprises a pair of sector gears, and a pair of rack gears that are mounted on the frame, each sector
20 gear engaging a different rack gear and being mounted at an end of different ones of the first and
21 second working surfaces.

22 9. (Original) The bending die of Claim 8, wherein said frame includes a generally U-shaped
23 portion defined by support members disposed adjacent to the end of one of the first and second
24 working surfaces, such that each rack gear is attached to a different support member.

25 10. (Currently Amended) The bending die of Claim 6 Claim 47, wherein said first and
26 second working surfaces are each generally rectangular in shape.

27 11. (Currently Amended) The bending die of Claim 6 Claim 47, wherein each hinge
28 assembly further comprises a first link and a second link joined by a pivot shaft, the first link being
29 coupled to one sector gear, and the second link being coupled to another sector gear.

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1 12. (Original) The bending die of Claim 1, wherein each of said first and second working surfaces
2 comprises an angled upper surface having a shape selected to facilitate over-bending of the sheet metal.

3 13. (Original) The bending die of Claim 1, further comprising a resist element that applies a
4 resisting force to said first and second working surfaces, the resisting force countering at least in part
5 a force applied to deform the sheet metal.

6 14. (Original) The bending die of Claim 13, wherein the resist element comprises at least one
7 of a stripper, a spring, an elastomeric material, a hydraulic component, a collapsible support, a
8 movable support, and a pneumatic component.

9 15. (Original) The bending die of Claim 13, wherein said resist element comprises:

10 (a) a channel, said channel having a dimension substantially equal to said fixed
11 separation;

12 (b) an elongate block partially disposed in said channel, said elongate block
13 having a dimension smaller than said fixed separation; and

14 (c) a spring disposed in said channel so as to apply a restoring force against said
15 elongate block in opposition to a deformation of the metal sheet into the channel, such that said
16 elongate block is returned to an original position after the metal sheet is removed following the
17 deformation of the metal sheet.

18 16. (Original) The bending die of Claim 1, further comprising a sector gear coupled to each
19 one of said first and second working surfaces.

20 17. (Original) The bending die of Claim 16, further comprising a prime mover, and a
21 plurality of driven gears configured to drivingly couple with the prime mover, each driven gear being
22 disposed to engage one of said sector gears, such that as each driven gear is rotated, the
23 corresponding sector gear is rotated.

24 18. (Original) The bending die of Claim 17, further comprising a plurality of shafts, such
25 that each driven gear is coupled to one of said plurality of shafts.

26 19. (Original) The bending die of Claim 16, wherein said frame comprises a plurality of rack
27 gears, such that each sector gear engages a different rack gear.

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1 20. (Original) The bending die of Claim 1, wherein each of said first and second working
2 surfaces comprises an elongate sector gear, and wherein said frame comprises opposed rack gears,
3 such that the elongate sector gear on each one of said first and second working surfaces engages a
4 different rack gear.

5 21. (Original) The bending die of Claim 1, further comprising a piston and a cylinder
6 assembly disposed adjacent to each of said first and second working surfaces, such that each one of
7 said first and second working surfaces is coupled to a different piston and cylinder assembly, each
8 piston and cylinder assembly applying one of a driving force and a resisting force to a different one
9 of the first and second working surfaces.

10 22. (Currently Amended) The bending die of ~~Claim 21~~ Claim 51, wherein each of said first
11 and second working surfaces comprises a wing, such that each wing is coupled to a different piston
12 and cylinder assembly.

13 23. (Currently Amended) The bending die of ~~Claim 21~~ Claim 51, wherein each piston and
14 cylinder assembly comprises one of a hydraulic system, a pneumatic system, and a mechanical
15 system.

16 24. (Currently Amended) The bending die of ~~Claim 21~~ Claim 51, wherein each piston and
17 cylinder assembly is coupled to an actuator that controls a movement of said first and second working
18 surfaces.

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1 25. (Currently Amended) A press brake for use in sheet metal forming, comprising:

2 (a) a first die extending longitudinally relative to a longitudinal axis of the press
3 brake, said first die including a working surface configured to support a work piece, said working
4 surface having an inner edge and an outer edge and being generally planar;

5 (b) a second die extending longitudinally relative to the longitudinal axis of the press
6 brake and disposed adjacent to said first die, said second die including a working surface
7 configured to support a work piece, said working surface having an inner edge and an outer edge and
8 being generally planar; and

9 (c) a frame coupled to and supporting said first and second dies, while enabling
10 said first and second dies to move relative to the frame, such that each die is able to rotate about a
11 different respective center of rotation, and so that regardless of any rotational angular displacement of
12 the die relative to the frame, the inner edge of the die is disposed closer to the respective center of
13 rotation of the die than the outer edge of the die.

14 26. (Original) The press brake of Claim 25, wherein a substantially fixed separation is
15 maintained between adjacent inner edges of the first and second dies, regardless of the rotational
16 angular displacement of either one of the first and second dies about its respective center of rotation.

17 27. (Original) The press brake of Claim 26, wherein said frame is adjustable, so that said
18 substantially fixed separation can be adjusted to a desired dimension, the desired dimension being
19 substantially maintained regardless of the rotational angular displacement of either of the first and
20 second dies.

21 28. (Previously Presented) The press brake of Claim 25, further comprising at least one
22 spring operatively coupled to at least one of the first and the second dies, producing a restoring force
23 that acts to return said first die and said second die to their respective original positions, after they
24 have been rotatably displaced.

25 29. (Original) The press brake of Claim 25, further comprising a hinge assembly disposed at
26 each end of the first and second dies, said hinge assemblies pivotally coupling said first and second
27 dies together, such that a displacement of one of said first and second dies results in a corresponding
28 displacement of the other of said first and second dies.

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1 30. (Original) The press brake of Claim 29, wherein each hinge assembly comprises a pair of
2 sector gears, and a pair of rack gears mounted on the frame, each sector gear engaging a different
3 rack gear and being mounted at an end of different ones of the first and second dies.

4 31. (Original) The press brake of Claim 25, wherein each of said first and second dies
5 comprises an elongate sector gear, and wherein said frame comprises opposed rack gears, each
6 elongate sector gear of said first and second dies engaging a different rack gear.

7 32. (Original) The press brake of Claim 25, further comprising means for applying a force to
8 each of said first and second dies, the force being applied for one of:

- 9 (a) countering at least in part a force applied to deform the sheet metal; and
10 (b) causing the rotational angular displacement of said first and second dies, in
11 order to achieve a desired deformation of the sheet metal.

12 33. (Currently Amended) The press brake of ~~Claim 32~~ Claim 50, wherein each of said first
13 and second dies comprises a wing, each wing being coupled to said means for applying a force.

14 34. (Currently Amended) The press brake of ~~Claim 32~~ Claim 50, wherein said means
15 comprises one of a spring, an elastomeric material, a hydraulic system, and a pneumatic system.

16 35. (Currently Amended) The press brake of ~~Claim 32~~ Claim 50, wherein each of said first
17 and second dies comprises a sector gear, and wherein said means comprises a prime mover and a
18 plurality of driven gears that are drivingly coupled with the prime mover, to drivingly rotate the
19 sector gear of each of said first and second dies.

20 36. (Original) The press brake of Claim 25, wherein each of said first and second dies
21 comprises a sector gear, and said frame comprises a rack gear configured to engage each of said first
22 and second dies.

23 37. (Previously Canceled)

24 38. (Previously Canceled)

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1 39. (Previously Presented) A method for forming sheet metal, comprising the steps of:

- 2 (a) providing adjacent longitudinally extending, rotatable support surfaces;
- 3 (b) positioning the sheet metal on the rotatable support surfaces; and
- 4 (c) applying a deforming force to the sheet metal, causing the rotatable support
5 surfaces to rotate in opposite directions in response to the deforming force, while maintaining a
6 substantially fixed separation between adjacent edges of the rotatable support surfaces as they are
7 rotatably displaced, said sheet metal being supported by the rotatable support surfaces when
8 deformed by the deforming force into a desired shape.

9 40. (Previously Presented) The method of Claim 39, further comprising the step of restoring
10 the rotatable support surfaces to an original position after the deforming force and the sheet metal are
11 removed.

12 41. (Original) The method of Claim 39, wherein the step of maintaining the substantially
13 fixed separation comprises the step of coupling the rotatable support surfaces to a framework with
14 gears that constrain a rotatable displacement of the rotatable support surfaces so that a width of a gap
15 between the adjacent edges of the rotatable support surfaces remains substantially fixed.

16 42. (Currently Amended) A method for forming sheet metal, comprising the steps of:

- 17 (a) providing adjacent longitudinally extending, rotatable support surfaces, each
18 support surface including a generally planar portion configured to contact the sheet metal, each
19 portion having an inner edge and an outer edge that extend along a longitudinal axis of the support
20 surface;
- 21 (b) positioning the sheet metal on the rotatable support surfaces; and
- 22 (c) applying a deforming force that causes the rotatable support surfaces to rotate
23 about different respective centers of rotation, so that for each support surface, regardless of a
24 rotational angular displacement of the support surface about its respective center of rotation, the
25 center of rotation remains fixed, and so that the inner edge of the portion is disposed closer to the
26 center of rotation than the outer edge of the portion.

27 43. (Previously Presented) The method of Claim 42, wherein the step of applying a
28 deforming force comprises the step of applying the deforming force to the sheet metal with an upper
29 tool that contacts the sheet metal, such that the rotatable support surfaces rotatably move in response
30 to the deforming force applied by the upper tool against the sheet metal.

1 44. (Previously Presented) The method of Claim 42, wherein the step of applying a
2 deforming force to the sheet metal comprises the step of applying the deforming force to the rotatable
3 support surfaces, such that the rotatable support surfaces apply the deforming force to the sheet metal,
4 while an upper tool provides support for the sheet metal.

5 45. (Previously Canceled)

6 46. (Previously Canceled)

7 47. (New) A bending die for use in sheet metal forming, comprising:

8 (a) a first working surface extending longitudinally relative to a longitudinal axis
9 of the bending die;

10 (b) a second working surface extending longitudinally relative to the longitudinal
11 axis of the bending die and disposed adjacent to said first working surface;

12 (c) a frame configured to provide support for said first and second working
13 surfaces, while enabling said first and second working surfaces to move relative to the frame, such
14 that a substantially fixed separation between adjacent edges of the first and second working surfaces
15 is maintained, regardless of a rotational angular displacement of either of the first and second
16 working surfaces; and

17 (d) a hinge assembly disposed at each end of the first and second working
18 surfaces, each hinge assembly pivotally coupling said first and second working surfaces together,
19 such that a rotational displacement of one of said first and second working surfaces results in a
20 corresponding rotational displacement of the other one of said first and second working surfaces,
21 through an opposite rotational direction.

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1 48. (New) A bending die for use in sheet metal forming, comprising:

2 (a) a first working surface extending longitudinally relative to a longitudinal axis
3 of the bending die, a sector gear being coupled to said first working surface;

4 (b) a second working surface extending longitudinally relative to the longitudinal
5 axis of the bending die and disposed adjacent to said first working surface, a sector gear being
6 coupled to said second working surface;

7 (c) a frame configured to provide support for said first and second working
8 surfaces, while enabling said first and second working surfaces to move relative to the frame, such
9 that a substantially fixed separation between adjacent edges of the first and second working surfaces
10 is maintained, regardless of a rotational angular displacement of either of the first and second
11 working surfaces;

12 (d) a prime mover; and

13 (e) a plurality of driven gears configured to drivingly couple with the prime
14 mover, each driven gear being disposed to engage one of said sector gears, such that as each driven
15 gear is rotated, the corresponding sector gear is rotated.

16 49. (New) A bending die for use in sheet metal forming, comprising:

17 (a) a first working surface extending longitudinally relative to a longitudinal axis
18 of the bending die, the first working surface comprising an elongate sector gear;

19 (b) a second working surface extending longitudinally relative to the longitudinal
20 axis of the bending die and disposed adjacent to said first working surface, the second working
21 surface comprising an elongate sector gear; and

22 (c) a frame configured to provide support for said first and second working
23 surfaces, while enabling said first and second working surfaces to move relative to the frame, such
24 that a substantially fixed separation between adjacent edges of the first and second working surfaces
25 is maintained, regardless of a rotational angular displacement of either of the first and second
26 working surfaces, said frame comprising opposed rack gears, such that the elongate sector gear on
27 each one of said first and second working surfaces engages a different rack gear.

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1 50. (New) A press brake for use in sheet metal forming, comprising:

2 (a) a first die extending longitudinally relative to a longitudinal axis of the press
3 brake, said first die including a working surface configured to support a work piece, said working
4 surface having an inner edge and an outer edge;

5 (b) a second die extending longitudinally relative to the longitudinal axis of the press
6 brake and disposed adjacent to said first die, said second die including a working surface
7 configured to support a work piece, said working surface having an inner edge and an outer edge;

8 (c) a frame coupled to and supporting said first and second dies, while enabling
9 said first and second dies to move relative to the frame, such that each die is able to rotate about a
10 different respective center of rotation, and so that regardless of any rotational angular displacement of
11 the die relative to the frame, the inner edge of the die is disposed closer to the respective center of
12 rotation of the die than the outer edge of the die; and

13 (d) means for applying a force to each of said first and second dies, the force being
14 applied for one of:

15 (i) countering at least in part a force applied to deform the sheet metal; and
16 (ii) causing the rotational angular displacement of said first and second
17 dies, in order to achieve a desired deformation of the sheet metal..

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1 51. (New) A bending die for use in sheet metal forming, comprising:

2 (a) a first working surface extending longitudinally relative to a longitudinal axis
3 of the bending die;

4 (b) a second working surface extending longitudinally relative to the longitudinal
5 axis of the bending die and disposed adjacent to said first working surface;

6 (c) a frame configured to provide support for said first and second working
7 surfaces, while enabling said first and second working surfaces to move relative to the frame, such
8 that a substantially fixed separation between adjacent edges of the first and second working surfaces
9 is maintained, regardless of a rotational angular displacement of either of the first and second
10 working surfaces; and

11 (d) a piston and a cylinder assembly disposed adjacent to each of said first and
12 second working surfaces, such that each one of said first and second working surfaces is coupled to a
13 different piston and cylinder assembly, each piston and cylinder assembly applying one of a driving
14 force and a resisting force to a different one of the first and second working surfaces.

15 52. (New) A bending die for use in sheet metal forming, comprising:

16 (a) a first working surface extending longitudinally relative to a longitudinal axis
17 of the bending die;

18 (b) a second working surface extending longitudinally relative to the longitudinal
19 axis of the bending die and disposed adjacent to said first working surface; and

20 (c) a frame configured to provide support for said first and second working
21 surfaces, while enabling said first and second working surfaces to move relative to the frame, such
22 that a substantially fixed separation between adjacent edges of the first and second working surfaces
23 is maintained, regardless of a rotational angular displacement of either of the first and second
24 working surfaces, said frame comprising a first section and a second section, a position of said first
25 section relative to said second section being adjustable to enable a width of a gap separating the
26 adjacent edges of said first and second working surfaces to be adjusted to a desired dimension.